translation

PCT/EP2003/008403

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 0000053854	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/EP2003/008403	International filing date (*day/month/year*) 30 July 2003 (30.07.2003)	Priority date (*day/month/year*) 20 August 2002 (20.08.2002)
International Patent Classification (IPC) or national classification and IPC C07D 307/08		
Applicant BASF AKTIENGESELLSCHAFT		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 6 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 1 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the report
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
13 February 2004 (13.02.2004)	09 September 2004 (09.09.2004)
Name and mailing address of the IPEA/EP Facsimile No.	Authorized officer Telephone No.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/EP2003/008403

I. Basis of the report

1. With regard to the **elements** of the international application:*

☐ the international application as originally filed

☒ the description:

pages 1-9, as originally filed

pages _____, filed with the demand

pages _____, filed with the letter of _____

☒ the claims:

pages _____, as originally filed

pages _____, as amended (together with any statement under Article 19

pages _____, filed with the demand

pages 1-6, filed with the letter of 12 August 2004 (12.08.2004)

☐ the drawings:

pages _____, as originally filed

pages _____, filed with the demand

pages _____, filed with the letter of _____

☐ the sequence listing part of the description:

pages _____, as originally filed

pages _____, filed with the demand

pages _____, filed with the letter of _____

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.
These elements were available or furnished to this Authority in the following language _____ which is:

☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).

☐ the language of publication of the international application (under Rule 48.3(b)).

☐ the language of the translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages _____

☐ the claims, Nos. _____

☐ the drawings, sheets/fig _____

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* *Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rule 70.16 and 70.17).*

** *Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.*

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-6	YES
	Claims		NO
Inventive step (IS)	Claims	1-6	YES
	Claims		NO
Industrial applicability (IA)	Claims	1-6	YES
	Claims		NO

2. Citations and explanations

1. Relevant documents

This report refers to the following search report citations (documents D1 to D3) using reference numbers that will be retained throughout the remainder of the procedure:

D1: US-B1-6316640
D2: Derwent WPI; AN: 1986-193392 (JP(A) 61126080)
D3: Derwent WPI; AN: 2001-183580 (CN(A) 1272495)

2. Novelty

The application discloses a process for producing THF by reacting a 1,4-butanediol-containing reaction mixture over a non-predried heteropolyacid catalyst, characterised in that the reaction mixture contains less than 1 ppm of basic nitrogen components and 2-(4-hydroxybutoxy)tetrahydrofuran.

The process disclosed in document D1 is the same as that of claim 1 of the present application, except that a different catalyst is used in the reaction mixture (see the example in column 5) and the quantity of basic nitrogen components in the reaction mixture is not mentioned.

The abstracts of documents D2 and D3 also disclose processes which are the same as that of claim 1 of the present application, except that there is no mention of the presence of 2-(4-hydroxybutoxy)tetrahydrofuran or basic nitrogen components in the reaction mixture.

The subject matter of claim 1 can be considered novel (PCT Article 33(2)). Dependent claims 2 to 6 are also considered novel.

3. Inventive step

The problem addressed by the present invention is that of providing an alternative process for producing THF from a reaction mixture containing both 1,4-butanediol and 2-(4-hydroxybutoxy)tetrahydrofuran.

Document D1, which is considered to be the closest prior art, discloses a process for producing THF in the presence of a γ Al_2O_3 catalyst from a reaction mixture that contains 1,4-butanediol and also other components such as 2-(4-hydroxybutoxy)tetrahydrofuran. The main difference between the process of D1 and that of the present claim 1 is the character of the catalyst used, which in D1 is γ Al_2O_3 and in the present application is a heteropolyacid. D1 also makes no mention of the presence of basic nitrogen components in the reaction mixture.

Taking the process of D1 as a starting point, the solution to the aforementioned problem lies in providing a process that uses a heteropolyacid instead of a γ Al_2O_3 catalyst. D1 describes the catalysts that can be used in the process (see column 3, lines 42 to 50), and it is known from the description in D1 that a heteropolyacid is equivalent to a γ Al_2O_3 catalyst and can if necessary be substituted for it.

D1 and D2 both disclose processes for producing THF from 1,4-butanediol, using different catalysts. D1 mentions heteropolyacids as possible catalysts, and D2 specifies the heteropolyacids used and also the quantity in each case. However, the technical feature "quantity of basic nitrogen components" is not found in the prior art according to D1, D2 and D3. The present application shows that the claimed process has been found to work particularly efficiently and with a long catalyst service life if the reaction mixture contains basic nitrogen components in an amount of less than 1 ppm (page 6, second paragraph, example 1). This is surprising and cannot be derived from the prior art.

The solution proposed in claim 1 of the present application is therefore considered inventive (PCT Article 33(3)). The same applies to dependent claims 2 to 6.